

CLAIMS

1. An insulation package arrangement for insulating the interior of an aircraft fuselage, whose structural unit not only includes stringers (31) with which all
5 the panels of an outer skin (33) of an aircraft fuselage structure are stiffened, but also several ribs (32) which are arranged perpendicular to the longitudinal axis (9) of the aircraft at a specified distance (c), and which are attached to the stringer (31), with a rib carrier (40) being integrated into said ribs (32) on the unattached end which rib carrier (40) continues parallel to the longitudinal
10 axis (9) of the aircraft, in which arrangement several fuselage insulation packages (19 to 22) which comprise an elongated package shape are situated in the direction of the longitudinal axis (9) of the aircraft at the fuselage structure of the aircraft, wherein said fuselage insulation packages (19 to 22) which longitudinally rest against a support surface (31a) of the stringers (31) which are attached to the aircraft fuselage or which are placed so as to longitudinally rest against an inner area (33a) of a panel of the outer skin, and these fuselage insulation packages (19 to 22) are attached on a longitudinal
15 side (41, 41a, 41b) of the ribs (32, 32a, 32b, 32c), which additionally are arranged so as to be completely enclosed by a foil (11) and within a space enclosed by interior paneling and by the panels of an outer skin; whose design is implemented with burn-through-proof insulation of a larger cross section and/or with a burn-through-proof barrier layer of a smaller cross section, which are arranged either individually or in combination within the fuselage insulation package (19 to 22), in which the insulation or the barrier
20 layer is guided so as to be situated either close to or resting against an interior wall region of the foil wall, or only the insulation is attached outside and resting against the circumference of the foil (11) of the fuselage insulation package (19 to 22), which on the long end of the fuselage insulation package (19 to 22) continues outward with a flat insulation end section (12, 12a, 12b)
25 which in a rib attachment region (15) arranged below the longitudinal sides (41, 41a, 41b) of a rib (32, 32a, 32b, 32c) and adjacent to the stringer (31) is
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attached with burn-through-proof attachment elements (4,13) to the rib (32, 32a, 32b, 32c).

- 5 2. The insulation package arrangement of claim 1, wherein in the rib attachment region (15) a through hole (24) is drilled, and in a package region of the fuselage insulation package (19 to 22), which on one side adjoins a front- or rear-arranged longitudinal side (41a, 41b) of the rib, there is a hole-like leadthrough, and the ongoing insulation end section (12, 12a, 12b), which on
10 the other side is arranged so as to be adjacent to a front- or rear-arranged longitudinal side (41a, 41b) of the rib, comprises a hole-like recess.
- 15 3. The insulation package arrangement of claims 1 and 2, wherein a first attachment element (4), which has been implemented with a burn-through-proof insulation pin, is fed through the hole-like leadthrough, through the through hole and through the hole-like recess, provided the latter are arranged so as to be congruent.
- 20 4. The insulation package arrangement of claim 3, wherein the design of the insulation pin has been implemented with a cylindrical core element (25) which near the end of the pin (27) comprises a flange-like elevation (26) and a cylindrical plastic-like casing (28).
- 25 5. The insulation package arrangement of claim 4, wherein the core element (25) is embedded in the plastic-like casing (28).
- 30 6. The insulation package arrangement of claim 4, wherein approximately in the middle of the casing (28) a flange (29) exits, from which, starting at the cylindrical circumference of the casing (28) and parallel to the core element (25) across its extended length, several pine-tree-shaped elevations (30) are positioned which are arranged so as to be spaced apart from each other.

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7. The insulation package arrangement of claim 6, wherein the pine-tree-shaped elevations (30) are comparable to a type of stepped gradation (44) that is conical, wherein the gradation (44) starts at the circumference of the casing (28) and its tapering-off conical form is realized by a conical tapering-off of the circumference of the casing (28).
8. The insulation package arrangement of claim 4, wherein the end region (42) of the casing (28) is dome-shaped, in the form of a recess, wherein the external shape of said end region (42) has the shape of a paraboloid, comparable to the shape of a parabolic rotation body whose longitudinal section has been realized with a parabolic shape, wherein the branch end of the parabola is continued by a stepped gradation (44) drawn inward vertically in relation to the pin axis (43).
9. The insulation package arrangement of claim 4, wherein the core element (25) is made from metal, namely a steel, preferably a stainless steel, and the casing (28) comprises a plastic of poor thermal conductivity.
10. The insulation package arrangement of claims 1 and 8, wherein the design of the second attachment element (13) is implemented with a so-called truncated-cone body (cage body in the shape of a truncated cone) whose base area and cover area (46, 47) are implemented with insulation discs or ring elements which are designed so as to be burn-through proof, being joined by a burn-through-proof insulation jacket (50) on the side of the disc margin or ring margin by a disc or ring of a larger external circumference.
11. The insulation package arrangement of claims 8 and 10, wherein the cover area of the truncated-cone body comprises a first insulation disc, where a hole has been made in the middle of the disc, whose diameter is smaller than or almost the same as the external diameter of the end region (42), in the shape of a paraboloid, of the dome-shaped casing (28), so that the holed wall of the insulation disc (due to the flexibility of the plastic material) can be guided

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with a tight fit over the branch end of the parabola of the parabolic end region (42) of the casing (28).

- 5 12. The insulation package arrangement of claim 10, wherein the cover area (47) of the truncated-cone body comprises a first plastic-like insulation ring (51) of a larger circumference and a second plastic-like insulation ring (49) of a smaller circumference, wherein on the interior diameter of the first insulation ring (48) and on the exterior diameter of the second insulation ring (49) several insulation braces (51), spaced apart on the circumference, are attached
10 in vertical position.
13. The insulation package arrangement of claims 4, 8, 10 and 12, wherein the design of the second insulation ring (49) comprises a disc-shaped core element (52) with a hole in the middle of the disc, whose hole diameter is
15 smaller than or almost the same as the external diameter of the end region (42) of the dome-shaped casing (48) implemented in the shape of a paraboloid, and comprises a plastic-like casing.
14. The insulation package arrangement of claim 13, wherein the disc-shaped
20 core element (42) is embedded in the plastic-like casing.
15. The insulation package arrangement of claim 13, wherein the disc-shaped
25 core element (42) is made from metal, namely a steel, preferably a stainless steel, and the casing of the core element (42) comprises a plastic of poor thermal conductivity.
16. The insulation package arrangement of claim 10, wherein the second
30 attachment element (13) is implemented as a cage body in the shape of a truncated cone whose base area and cover area (46, 47) are joined on the side of the disc margin by a disc of a larger circumference or on the side of the ring margin by a disc of larger diameter, wherein there are several insulation braces (51) designed so as to be burn-through proof which support a second

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insulation disc of the base area (46) against a first insulation disc or the first insulation ring (48) of the cover area (47).

17. The insulation package arrangement of claims 1 to 3 and 10, wherein several
5 fuselage insulation packages (19 to 22), which are positioned in a region of the fuselage structure which is delimited by ribs (32, 32a, 32b, 32c), are arranged on the inner structure of the fuselage, and the hole-like recess of the flat insulation end sections (12, 12a, 12b) of those (at least two) fuselage insulation packages (19 to 22) which on one longitudinal side (41, 41a, 41b)
10 of the rib (32, 32a, 32b, 32c) continue in an insulation section, are conveyed to the first attachment element (4) which is an insulation pin designed to be burn-through proof, as a result of which an overlap of the insulation end sections (12, 12a, 12b) is formed on the respective longitudinal sides (41, 41a, 41b, 41c) of the respective ribs, with the attachment of said insulation
15 end sections (12, 12a, 12b) on the longitudinal sides (41, 41a, 41b, 41c) of the ribs to the first attachment element (4) is secured with the second attachment element (13), which is an insulation disc or ring element.
18. The insulation package arrangement of claim 1, wherein the design and the
20 position of the individual fuselage insulation package (19 to 22) agrees with that of a traditionally used field insulation package, which in the direction of the aircraft axis (9) is situated on the aircraft fuselage structure or near the latter, and longitudinally adjoins that stringer support area (31a) of the stringer (31) at a defined distance (c) and of a traditionally used rib insulation
25 package which adjoins the longitudinal sides (41, 41a, 41b) of the ribs and the rib carrier (40) of the individual rib (32, 32a, 32b, 32c); which in each instance comprises the combination of the individual field- and rib insulation package which is completely enclosed by a burn-through-proof foil (11) and/or comprises burn-through-proof insulation and/or a burn-through-proof
30 barrier layer, wherein the burn-through-proof elements of the respective field- and rib insulation package continue without interruption from the combined fuselage insulation package (19 to 22).

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19. The insulation package arrangement of claim 1, wherein the flat insulation end sections (12, 12a, 12b), which continue from a fuselage insulation package (19 to 22, are screwed or riveted to a burn-through-proof attachment element, structure holder (53) which jutting out from the stringer (31) is attached to the outer skin (33), or to the head of the individual rib (32, 32a, 32b, 32c) which is extended from the unattached end of the rib (32, 32a, 32b, 32c), or attached to the rib carrier (40).
20. The insulation package arrangement of claim 19, wherein in the area of system precautions which relate to the structure holder (53) and to a separate support element against which the holder rests, the insulation (1) and the foil (11) and/or the insulation sections (12a, 12b) of the fuselage insulation packages (19 to 22), which constitute a fire barrier, are screwed and riveted.
21. The insulation package arrangement of claim 1, wherein the further attachment element is a rivet, comprising steel or titanium, or is a screw connection element comprising steel or titanium or plastic.
22. The insulation package arrangement of claim 21, wherein the screw connection element is a screw and nut made from aramide or a CFK material.

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Reference characters

	1	Insulation material
	2	Enclosing foil
5	3	Insulation package
	4	First attachment element; insulation pin
	7	Post-crash fire scenario; fire
	8	Aircraft structure
	9	Longitudinal axis of the aircraft
10	11	Burn-through-proof foil
	12	Flat insulation end section
	12a	First insulation end section
	12b	Second insulation end section
	13	Second attachment element, truncated-cone body
15	15	Rib attachment region
	17	Field insulation package
	18	Rib insulation package
	19	Rib insulation package, third
	20	Rib insulation package, first
20	21	Rib insulation package, second
	22	Rib insulation package, fourth
	24	Through hole; drill hole
	25	Core element (of the first attachment element 4), cylindrical
	26	Elevation (of the core element 25), flange-like
25	27	Pin end (of the core element 25)
	28	Casing
	29	Flange
	30	Elevation, pine-tree-like
	31	Stringer
30	31a	Stringer support area
	32	Rib
	32a	First rib

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	32b	Second rib
	32c	Third rib
	33	Outer skin
	33a	Inner area (of a panel of the outer skin 33)
5	40	Rib carrier
	40a	End (of the rib carrier 40)
	41	Longitudinal side of the rib
	41a	First longitudinal side of the rib; rear (left), lateral
	41b	Second longitudinal side of the rib; front (right), lateral
10	42	End region
	43	Pin axis (of the first attachment element 4)
	44	Gradation
	46	Base area (of the second attachment element 13)
	47	Cover area (of the second attachment element 13)
15	48	First insulation ring
	49	Second insulation ring
	50	Insulation jacket
	51	Insulation brace
	52	Core element, disc-shaped
20	53	Structure holder
	a	Spacing (between the pine-tree-like elevations 30)
	b	Spacing (between the insulation rings 48, 49)
	c	Spacing (between the ribs 32, 32a, 32b, 32c)